These claims have been amended to more clearly and precisely point out and claim the invention, care being taken to avoid the introduction of new matter.

In the Office Action dated September 20, 2000, claims 1-8, 16-22 and 26-27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pickens et al. U.S. 5,122,339 (PTO-1449, claim 1); Pickens et al. U.S. 5,211,910 (PTO-1449, Abstract); Pickens et al. U.S. 5,259,897 (PTO-1449, abstract); JP 01025954 (abstract); WO 9532074 (abstract); WO 9212269 (abstract); DE 2810932 (abstract). There are also numerous 35 USC 112 rejections which Applicants believe have been satisfied.

Applicants appreciate the review by the Examiner in response to a telephone call regarding the lack of discussion of pending independent Claim 12. It is Applicants' understanding that Claim 12 additionally stands rejected. In order to expedite prosecution, Applicants will argue Claim 12 as a rejected claim.

Examiner points out that the formula formerly in Claim 1 provides completely different wt. %'s than those previously stated in the claim, and also claims "equal to or less" than rather than the just "equal" as found in the specification. Also Claim 27 was dependent on the wrong claim. Amended Claim 1 now deletes the formula. The specification on page 2 at lines 27-29 allows up to about 4.5 wt. % copper, from about 0.6 to 6.0 wt. % magnesium and from about 0.01 – 1.0 wt.% lithium. It is believed this deletion will resolve all 35 USC 112 problems, since all the 35 U.S.C. objections were the formula itself and the formula amounts vs. previously recited amounts in Claim 1.

Applicants recognize the advantages of low lithium addition on page 5 at lines 6-9:

> "...Because of the addition of low levels of lithium additions, the problems of higher (i.e., over 1.5 wt% lithium) additions of lithium, <u>such as explosions</u> of the molten metal, are reduced or eliminated..." (emphasis added);

and also on page 6 at lines 5-8 Applicants recognize detrimental results of Al_3Li formation; and at lines 9-21 recognize formation of atom clusters providing improved fatigue performance:

> "... Lithium additions in amounts of about 1.5 wt% and above result in the formation of the δ' ("delta prime") phase with composition of Al_3Li. The presence of this phase, Al_3Li, is to be avoided in the alloys of the present invention...",

and very importantly

> "... The interaction of lithium atoms in supersaturated solid solution, with atoms of magnesium and/or copper appear to give rise to the formation of clusters of atoms of solute. This behavior is observed by the appearance of diffuse scatter in electron diffraction images. This behavior, which was not expected and is suprising, is apparently responsible for the improvements in fatigue performance of the alloys of the invention, which will be discussed below.
>
> It has been found, quite unexpectedly and suprisingly, that the combination of lower copper levels, higher magnesium levels and lower levels of lithium give a suprisingly strong, less dense aluminum alloy which has superior fatigue crack growth resistance..."

Pickens et al. '339 teaches welding alloys or welding wire with possible ranges of up to 4 wt.% Li (Abstract), preferably 0.2 to 3.1 wt.% Li, and most preferably 0.5 to 2.7 wt.% Li, pointing out that over 4.1 wt.% Li, its solubility limit is reached (Col 3, bottom). Pickens et al. '897 teaches ultrahigh strength alloys with possible ranges of 0.1 to 2.5 wt.% Li as well as 0.8 to 1.8 wt % Li, to provide "...high artificially-aged strength..." (Col. 1, ll 11-13). Pickens et al '910 teaches compounds somewhat similar to Pickens et al. '339 with possible ranges of 0.1 to 4 wt% Li or 0.5 to 2.6 wt% Li but having high artificially-aged strength as well as good weldability.

Actual reductions to practice for this art includes:

ACTUAL EXAMPLES OF % Li		TABLE
Pickens et al. '339	1.4 1.21 2.00 1.91 1.70 1.45 (Le Baron*) 1.0 1.21 1.32 to 2.10	III VIII XIV
Pickens et al. '897	1.3 to 1.7	II, IIa, IIb
Pickens et al '910	1.25 to 2.4	II
*Used as unsuitable comparative examples		

It seems, unless the Examiner can find lower Li content in actual samples made and tested, that all the Pickens et al. art never ventured into the low lithium content range claimed by Applicants, and could not have recognized advantages such as elimination of Al_3Li phase and atom clustering in the solute.

There appears to be no recognition in any of the Pickens et al. references of potential explosion problems in their ranges, Al_3Li phase problems, or advantageous solute atom clustering. Also as Applicants point out on page 2, lines 7 to 16 with regard to compositions having high artificially-aged strengths:

> "...of major importance in cryogenic applications are high strength and high fracture toughness. These properties are obtained by artificially aging the aluminum alloy. However, this aging will have a detrimental effect on fatigue crack growth resistance. In damage tolerant applications in aircraft, fatigue craft growth resistance is very important. Better fatigue crack growth resistance means that cracks will grow slower, thus making airplanes much safer because small cracks can be detected before they achieve critical size for catastrophic propagation..."

A reading of Applicants' application clearly indicates that Al-Cu-Li type compositions having high artificially-aged strength are undesirable for high fatigue performance, which is what this application is all about.

WO 9212269 (Abstract) teaches <u>possible ranges</u> of Li of 0.2 to 5.0 wt.% with preferred Li of 1.5 to 3.0 wt.% and <u>manufactured</u> with Li of 2.17 wt.%. WO 9532074 (Abstract) teaches possible ranges of Li of 0.4 to 2.0 wt.%. JP 01025954 (Abstract) teaches <u>possible ranges</u> of Li of 0.5-4.0 wt.% and <u>manufactured billet</u> with Li of 2.1 wt.%. DE 2810932 (Abstract) teaches <u>possible ranges</u> of Li of 0.4 to 0.8 in solid solution useful as a weldable alloy. Again, none of these references alone or in combination puts on skilled in the art in possession of Applicants; claimed invention or recognizes the importance of exclusion of an Al_3Li phase and formation of clusters of atoms of solute improving fatigue performance.

Applicants, in amended claims 1 and 12 <u>require</u> a maximum 0.99 wt.% Li content effectively preventing formation of an Al_3Li phase, and in amended claims 26 and 27 <u>require</u> a maximum 0.8 wt.% Li content where interaction of Li in solid solution gives rise to formation of clusters of atoms of solute providing high fatigue performance alloys. These limitations are

important, and not the result of mere routine experimentation, and must be considered, as the court stated in In re Boe and Duke, 184 U.S.P.Q. 38.40 (1974 C.C.P.A.):

"This court has stated that all limitations must be considered and that it is error to ignore specific limitations distinguishing over the references. In re Sather. 181 U.S.P.Q. 36,39 (1974 C.C.P.A.); In re Glass, 176 U.S.P.Q. 489,491 (1973 C.C.P.A.)"

Applicants are not exactly clear whether the 10 references are each cited individually under 35 U.S.C. 103 or are cited in general combination. In any case, the following precepts should be kept in mind in proceeding from the prior art to the invention claims, one cannot base obviousness on what a person skilled in the art might try, or find obvious to try, but must consider what the prior art would have led a person to do, as stated In re Tomlinson, Hall and Ceigle, 150 U.S.P.Q. 623,626 (1966 C.C.P.A.):

"Our reply to this view is simply that it begs the question; which is obviousness under section 103 of compositions and methods, not the direction to be taken in making efforts or attempts. Slight reflection suggests, we think that there is usually an element of 'obviousness to try' in any research endeavor, that it is not undertaken with complete blindness but rather with some semblance of on that as a test would not only by contrary to statute but result in a marked deterioration of the entire patent system as an incentive to invest in those efforts and attempts which go by the name of 'research' and also affirmed in the Gillette Co. v. S.C. Johnson and Son, Inc., 16 U.S.P.Q. 2d 1923, 1928 (Fed. Cir. 1990)."

Also, as for combinations, as stated by the court in In re Regal, 188 U.S.P.Q. 136, 139 (CCPA 1975):

"As we have stated in the past, there must be some logical reason apparent from positive, concrete evidence of record which justifies a combination of primary and secondary references. In re Stemniski, 170 U.S.P.Q. 343 (CCPA 1971). Further, as we stated in In re Bergel, 130 U.S.P.Q. 206 (CCPA 1961):

'The mere fact that it is possible to find two isolated disclosures which might be considered in such a way to produce a new compound

does not necessarily render such production obvious unless the art also contains something to suggest the desirability of the proposed combination'",

and also affirmed in In re Gergen, 11 USPQ 2d 1652, 1653 (Fed. Cir. 1989), and Symbol Technologies Inc. v. Opticon Inc., 19 USPQ 2d 1241, 1246 (Fed. Cir. 1991.)

Applicants state on page 6, at lines 9-13, that electron diffraction images show formation of clusters of atoms of solute which appears to be responsible for fatigue performance of the alloys claimed. This recognition does not appear to be seen in any of the references. This formation is required in amended Claims 1-8 and 27 and should be clearly allowable.

Applicants respectfully submit that neither Pickens et al. '339, Pickens et al. '910, Pickens et al '897, JP 01025954, WO 9532074, WO 9212269 nor DE 2810932, taken alone or in any combination, teach or make obvious to one skilled in the art at the time of the invention, the invention of the amended Claims 1-8, 12, 16-22, 26 and 27.

In view of the foregoing amendments and arguments, Applicants respectfully request reconsideration and allowance of amended Claims 1-8, 12, 16-22, 26 and 27.

Respectfully submitted,

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<u>Version with Markings to Show Changes Made</u>

<u>In the Claims</u>

Claims 1, 12, 26 and 27 have been amended as follows:

1. (Three times amended) An aluminum alloy consisting essentially of from about 3 to about 4.5 wt % copper, from about 1.0 to about 2 wt % magnesium and ~~from about 0.01 to about 0.99 wt%~~ lithium <u>in an amount of from 0.01 to 0.99 wt. %,</u> wherein the copper, magnesium and lithium are present in the aluminum alloy in the form of a solid solution~~, and the amounts of copper and magnesium correspond to the formula Cu ≤ (-3/5.4) (Mg-6)+1.5~~ and where interaction of lithium ions in the solid solution gives rise to formation of clusters of solute providing fatigue resistant alloys.

12. (Three times amended) An aluminum alloy consisting essentially of copper, magnesium and lithium, the lithium content being <u>in an amount of</u> from ~~about~~ 0.01 to 0.99 wt %, <u>effective to avoid formation of an Al_3Li phase</u>, and the copper and magnesium weight percent values falling within a closed area on a graph with wt % copper on the x-axis and wt % magnesium on the y-axis, said closed area being bounded by generally straight lines joining the following points:

POINT 1 = 3 Cu, 1.0 Mg
POINT 2 = 4.28 Cu, 1.0 Mg
POINT 3 = 3.7 Cu, 2 Mg
POINT 4 = 3 Cu, 2 Mg
and back to POINT 1.

26. (Amended) The aluminum alloy of Claim 1, wherein said lithium content comprises a maximum of 0.8 wt %<u>, and where the lithium is added in an amount effective to avoid formation of an Al_3Li phase.</u>

27. (Amended) The aluminum alloy of Claim 12, wherein said lithium content comprises a maximum of 0.8 wt %<u>, and where interaction of lithium ions in the solid solution gives rise to formation of clusters of atoms of solute providing fatigue resistant alloys.</u>